

DGFI Analysis Center Annual Report 2014

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Abstract This report presents the activities of the DGFI Analysis Center during 2014. Besides the regular IVS submissions, DGFI continued to reprocess 24-hour sessions including the estimation of source positions. DOGS-RI, the new VLBI analysis software to be used at DGFI, is near completion.

1 General Information and Component Description

The DGFI Analysis Center (AC) is located at the German Geodetic Research Institute (Deutsches Geodätisches Forschungsinstitut, or DGFI) in the city center of Munich in Germany. In 2014, DGFI was still an autonomous and independent research institution affiliated with the Bavarian Academy of Sciences and Humanities (BAdW) and funded by the Free State of Bavaria. In January 2015, DGFI became an institute of the Technische Universität München (TUM), and it is now called “DGFI-TUM”.

Research performed at DGFI covers many different fields of geodesy (geometric techniques, gravity field, Earth system modeling, etc.) and includes the contribution to national and international scientific services and research projects as well as various functions in scientific organizations (see <http://www.dgfi.tum.de>). DGFI closely cooperates with other TUM institutions (including personnel at the Geodetic Observatory

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Wetzell) and with BAdW within the framework of the Center of Geodetic Earth System Research (CGE).

DGFI has been acting as an IVS AC since the establishment of the IVS in 1999. Since November 2008, DGFI has been an operational AC regularly submitting constraint-free normal equations for 24-hour sessions in the SINEX format. Since 2008, DGFI has also been involved in the BKG/DGFI Combination Center.

2 Staff

In 2014, the DGFI AC had to cope with a rather low number of personnel again, as Manuela Seitz was still on maternity leave.

Table 1 Staff members and their main areas of activity.

Dr. Detlef Angermann	Group leader
Dr. Michael Gerstl	Development of the analysis software DOGS-RI
Dr. Ralf Schmid	Routine data analysis, combination of different space geodetic techniques
Dr. Manuela Seitz (currently on maternity leave)	CRF/TRF combination, ICRF3, combination of different space geodetic techniques

The activities of the DGFI AC were more or less limited to the routine analysis of 24-hour sessions which have been performed by Ralf Schmid since the end of May 2013. In addition, Michael Gerstl is engaged in the development of new VLBI analysis software called DOGS-RI (DGFI Orbit and Geodetic Parameter Estimation Software - Radio Interferom-

etry). Table 1 lists the staff members and their main areas of activity.

3 Current Status and Activities

Analysis Activities

In 2014, the DGFI AC continued to re-analyze 24-hour sessions including the estimation of source positions. Still using the analysis software OCCAM, the period from April 2008 to June 2011 could be covered. This means that, at the end of December 2014, consistent DGFI SINEX files were available from April 2008 to December 2014.

If operational and reprocessed solutions are summed up, DGFI analyzed 576 sessions altogether from seven consecutive years and submitted the corresponding daily SINEX files to the IVS. Among them were 212 IVS-R1, 210 IVS-R4, 29 VLBA, 26 EUROPE, 26 IVS-T2, 25 IVS-R&D, 15 CONT14, 13 IVS-OHIG, ten CONT08, seven APSG, and three CRF sessions (see Table 2).

Table 2 Sessions analyzed in 2014.

Session type	2008	2009	2010	2011	2012	2013	2014	Total
APSG	2	2	2	1	–	–	–	7
CONT08	10	–	–	–	–	–	–	10
CONT14	–	–	–	–	–	–	15	15
CRF	2	1	–	–	–	–	–	3
EUROPE	4	6	6	4	–	1	5	26
IVS-OHIG	3	3	2	2	–	3	–	13
IVS-R1	33	51	52	26	–	4	46	212
IVS-R4	36	50	52	26	–	3	43	210
IVS-R&D	6	9	3	4	–	2	1	25
IVS-T2	5	7	7	3	–	4	–	26
VLBA	4	6	6	3	3	2	5	29
Total	105	135	130	69	3	19	115	576

When reprocessing VLBI sessions from former years, it turned out that some of the databases available at the IVS Data Centers were incomplete. Table 3 shows the stations whose data were missing. Usually, the absence of a station was connected to a recorelation of the session.

In the meantime, all databases were resubmitted by the responsible agencies and, except for R4498, reanalyzed by the DGFI AC. All solutions could benefit significantly from the additional data.

Table 3 Missing stations in IVS databases prior to reprocessing.

Session	Database	Missing station(s)
R4498	11SEP01XE	Zc
R1471	11FEB21XA	Sh, Tc
R4454	10OCT28XE	Ma
R4444	10AUG19XE	Bd
R4428	10APR29XE	Ma, Zc
R4407	09DEC03XE	Bd, Zc
R4400	09OCT15XE	Wz
R4395	09SEP10XE	Tc
R4390	09AUG06XE	Ma
R4380	09MAY28XE	Bd
R4367	09FEB26XE	Ny
R4337	08JUL17XE	Zc
R4335	08JUL02XE	Kk
R4331	08JUN05XE	Ny
R4330	08MAY29XE	Bd
R4327	08MAY07XE	Sv

In addition, a newly combined multi-year solution based on VLBI and GNSS observations was set up to demonstrate the simultaneous realization of ICRS and ITRS. While the standard deviations of all parameters improve, the combination of LOD seems to shift the positions of certain VCS-only sources and some sources observed in RDV sessions, which has to be further investigated.

Software Development

The development of DOGS-RI is still in progress. Detailed comparisons with OCCAM have helped to debug the new software, and also to detect deficiencies in the operational OCCAM processing (e.g., files with a priori information were not up-to-date, etc.).

With DOGS-RI, the DGFI AC will have a software available that follows IERS 2010 Conventions and that can provide the new nutation parameters (dX , dY). A lot of time was spent on the proper relativistic calculation of the partial derivatives w.r.t. the parameters. In many places, difference quotients could be replaced by time derivatives.

The handling of station coordinates and discontinuities was facilitated, and DOGS-RI will allow a common adjustment of multiple sessions.

4 Future Plans

In 2015, we would like to continue reprocessing 24-hour sessions backward from April 2008. Further detailed comparisons between DOGS-RI and OCCAM will be necessary before we can switch to the new software.